

What is claimed is:

1. A circuit arrangement, comprising:

a line buffer having a width; and

an image scaling circuit coupled to the line buffer and configured to

generate a scaled image from a source image by partitioning the source image into

a plurality of partitions and image scaling each partition using the line buffer

wherein each partition has a width that is no greater than that of the line buffer,

and the scaled image has an overall width that is greater than that of the line

buffer.

2. The circuit arrangement of claim 1, wherein the plurality of partitions includes

first and second partitions arranged adjacent to one another in the source image, and

wherein the image scaling circuit is further configured to store boundary conditions for

the first partition for use during image scaling of the second partition.

3. The circuit arrangement of claim 2, wherein the image scaling circuit is configured to initiate a partition boundary save operation to store the boundary conditions

for the first partition upon image scaling a last line of the first partition, and to initiate a

partition boundary restore operation prior to image scaling a first line of the second

partition to retrieve the stored boundary conditions for use during image scaling of the

second partition.

4. The circuit arrangement of claim 3, wherein the image scaling circuit is

configured to initiate a partition boundary restore operation to retrieve the stored

boundary conditions prior to image scaling each line of the second partition.

5. The circuit arrangement of claim 2, wherein the boundary conditions initialize

the image scaling circuit during image scaling of the second partition to a state that would

occur were image scaling performed jointly on the first and second partitions.

1 6. The circuit arrangement of claim 2, wherein the boundary conditions include at
2 least one of a partition read start address, a partition write start address, a horizontal filter
3 pixel count, a horizontal filter pixel phase, a horizontal filter output count, a horizontal
4 filter reduction count, and a horizontal pixel decrement value.

(al9 ln 11-15, Appendix 1.1)

1 7. The circuit arrangement of claim 1, wherein the image scaling circuit
2 comprises:

3 a memory read unit configured to retrieve source image data from a
4 memory; ["Screen Memory" 29]

5 a horizontal filter unit coupled to the memory read unit and configured to
6 horizontally scale the source image data retrieved from the memory to generate
7 horizontally-scaled image data; (31), (41)

8 a vertical filter unit coupled to the horizontal filter unit and configured to
9 vertically scale the horizontally-scaled image data to generate scaled image data,
10 wherein the line buffer is disposed in the vertical filter unit; and (31), (39)

11 a memory write unit coupled to the vertical filter and configured to store
12 the scaled image data in the memory. (29)

(52, 1)

1 8. The circuit arrangement of claim 7, further comprising a save/restore circuit
2 configured to initiate a partition boundary save operation upon processing of a last line of
3 a first partition, and to initiate a partition boundary restore operation prior to processing a
4 first line of a second partition to retrieve the stored boundary conditions for use during
5 image scaling of the second partition.

1 9. The circuit arrangement of claim 7, wherein each of the memory read and write
2 units includes a pixel format converter.

— Give "D/A converter" 35) . al4 ln 59-62 .

1 10. The circuit arrangement of claim 7, wherein each of the vertical and
2 horizontal filter units includes a symmetric non-linear filter.

(56-7)

1 11. The circuit arrangement of claim 1, wherein the line buffer has a width less
2 than or equal to about 512 pixels. 49 h 4-5

1 12. The circuit arrangement of claim 1, wherein each partition includes a plurality
2 of lines, wherein the image scaling circuit is configured to image scale each partition by
3 longitudinally scaling each of the plurality of lines, and wherein the width of each line of
4 each partition is no greater than that of the line buffer after longitudinal scaling.

1 13. The circuit arrangement of claim 1, wherein each partition includes a plurality
2 of lines, wherein the image scaling circuit is configured to image scale each partition by
3 longitudinally scaling each of the plurality of lines, and wherein the width of each line of
4 each partition is no greater than that of the line buffer after prior to longitudinal scaling.

⇒ 56-7
F2,

1 14. An integrated circuit device comprising the circuit arrangement of claim 1.

1 15. An apparatus comprising the circuit arrangement of claim 1.

[integrated
circuit chip]
49 h 3-7

1 16. A program product, comprising a hardware definition program that defines
2 the circuit arrangement of claim 1; and a signal bearing media bearing the hardware
3 definition program, wherein the signal bearing media includes at least one of a
4 transmission type media and a recordable media.

ALS,
(45 h 1-7)

1 17. A method of scaling a graphical image, the method comprising:
2 partitioning a source image into a plurality of partitions; and
3 image scaling each partition using the line buffer to generate a scaled
4 image, wherein each partition has a width that is no greater than that of the line
5 buffer, and the scaled image has an overall width that is greater than that of the
6 line buffer.

} #1

1 18. The method of claim 17, wherein the plurality of partitions includes first and
2 second partitions arranged adjacent to one another in the source image, and wherein
3 image scaling the first partition includes storing boundary conditions for the first partition
4 for use during image scaling of the second partition.

} #2

1 19. The method of claim 18, wherein storing boundary conditions for the first
2 partition includes initiating a partition boundary save operation to store the boundary
3 conditions for the first partition upon image scaling a last line of the first partition, and
4 wherein image scaling the second partition includes initiating a partition boundary restore
5 operation prior to image scaling a first line of the second partition to retrieve the stored
6 boundary conditions for use during image scaling of the second partition.

} #3

1 20. The method of claim 19, wherein initiating the partition boundary restore
2 operation is performed prior to image scaling each line of the second partition.

} #4

1 21. The method of claim 18, wherein the boundary conditions initialize an image
2 scaling circuit that performs the image scaling during image scaling of the second
3 partition to a state that would occur were image scaling performed jointly on the first and
4 second partitions.

} #5

1 22. The method of claim 18, wherein the boundary conditions include at least one
2 of a partition read start address, a partition write start address, a horizontal filter pixel
3 count, a horizontal filter pixel phase, a horizontal filter output count, a horizontal filter
4 reduction count, and a horizontal pixel decrement value used by an image scaling circuit. | 6

1 23. The method of claim 17, wherein image scaling is performed by an image
2 scaling circuit that includes:

3 a memory read unit configured to retrieve source image data from a
4 memory;

5 a horizontal filter unit coupled to the memory read unit and configured to
6 horizontally scale the source image data retrieved from the memory to generate
7 horizontally-scaled image data; | 7

8 a vertical filter unit coupled to the horizontal filter unit and configured to
9 vertically scale the horizontally-scaled image data to generate scaled image data,
10 wherein the line buffer is disposed in the vertical filter unit; and

11 a memory write unit coupled to the vertical filter and configured to store
12 the scaled image data in the memory.

1 24. The method of claim 23, wherein the image scaling circuit further includes a
2 save/restore circuit configured to initiate a partition boundary save operation upon
3 processing of a last line of a first partition, and to initiate a partition boundary restore
4 operation prior to processing a first line of a second partition to retrieve the stored
5 boundary conditions for use during image scaling of the second partition. | 8

1 25. The method of claim 17, wherein each partition includes a plurality of lines,
2 wherein image scaling each partition includes longitudinally scaling each of the plurality
3 of lines, and wherein the width of each line of each partition is no greater than that of the
4 line buffer after longitudinal scaling. | 9
| 12

1 26. The method of claim 17, wherein each partition includes a plurality of lines,
2 wherein image scaling each partition includes longitudinally scaling each of the plurality
3 of lines, and wherein the width of each line of each partition is no greater than that of the
4 line buffer prior to longitudinal scaling.

⇒ #1

1 27. A method of scaling a graphical image, the method comprising:

2 transferring image data for a source image from a memory to a horizontal
3 filter such that the horizontal filter receives the image data arranged into a ^[source] ^[screen memory]
4 plurality of horizontally-arranged partitions, with each partition including a ^[31, 43]
5 plurality of lines of image data; ^[sub-divided]

6 horizontally scaling each line of image data in each partition using the
7 horizontal filter to generate a plurality of horizontally-scaled lines of image data; ^[11]
8 and

9 vertically scaling the plurality of horizontally-scaled lines of image data ^[16]
10 using a vertical filter to generate a scaled image, wherein the vertical filter ^[31, 39]
11 includes at least one line buffer configured to store the horizontally-scaled lines of ^[16]
12 image data, and wherein each horizontally-scaled line of image data has a width
13 that is no greater than that of the line buffer, and the overall width of the scaled
14 image is greater than that of the line buffer. ^[57, 58, 49]